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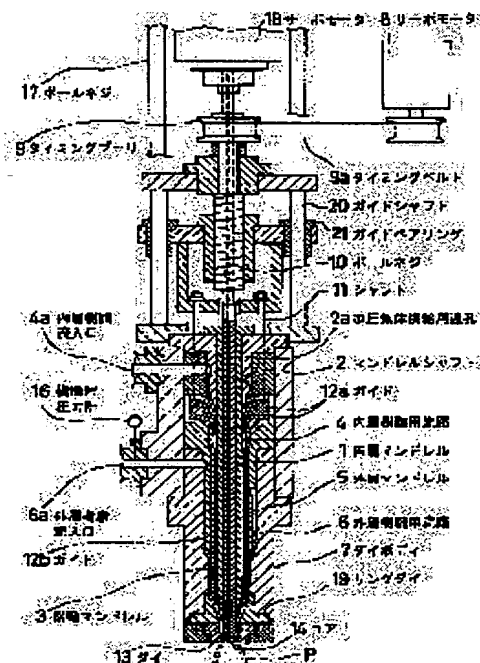
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## (54) BLOW MOLDING HEAD FOR TWO-LAYERED HOLLOW MOLDED ARTICLE

### (57)Abstract:

**PROBLEM TO BE SOLVED:** To provide the blow molding head of a two-layered hollow molded article capable of easily controlling (controlling and adjusting) the thickness uniformity, ratio, sharpness or the like of inner and outer resin layers by interposing a vertically slidable cylindrical slide mandrel between inner and outer layer resin flow passages and performing the changeover of a molded article in a short time.

**SOLUTION:** An inner layer resin flow passage 4 and an outer layer resin flow passage 6 are formed by interposing a vertically slidable cylindrical slide mandrel 3 between both flow passages and this cylindrical slide mandrel 3 is slid vertically to increase or reduce the inflow of an inner or outer layer resin for a short time with high accuracy to easily mold a god molded article having a thick-walled inner or outer layer and a thin-walled outer or inner layer.



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**CLAIMS**

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[Claim(s)]

[Claim 1] It is equipment for blow molding of the two-layer-like blow molding article which the synthetic resin by which melting was carried out separately is made to join in the passage for resin, unifies, and is made to flow out from die opening. The mandrel shaft which has a through-hole for pressurization gas supply is fitted into a core possible [ sliding of the vertical direction ] to a tubed inner layer mandrel at the inner skin of the tubed inner layer mandrel prepared fixed. While forming the passage for inner layer resin and allotting the tubed sliding mandrel which can slide in the vertical direction to the periphery side of a tubed inner layer mandrel between a tubed inner layer mandrel and its tubed sliding mandrel The head for blow molding of the two-layer-like blow molding article characterized by having fitted in the tubed outer layer mandrel fixed in the condition that a tubed sliding mandrel can slide on the peripheral face of a tubed sliding mandrel, having formed the passage for outer layer resin in the periphery side of the tubed outer layer mandrel, and preparing the die body.

[Claim 2] while forming the fluting of various configurations in the ring die by the side of the outer layer resin passage side point of a tubed sliding mandrel, or the die body which counters this -- these -- exchange -- the head for blow molding of the two-layer-like blow molding article according to claim 1 characterized by supposing that it is easy.

[Claim 3] Claim 1 by which it is forming-control device which synchronizes sliding movement [ of the vertical direction of a tubed sliding mandrel ], and inflow of resin of each class characterized, and the head for blow molding of a two-layer-like blow molding article according to claim 2.

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## DETAILED DESCRIPTION

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### [Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the head for carrying out blow molding of the two-layer-like blow molding article.

[0002]

[Description of the Prior Art] As equipment for carrying out blow molding of the two-layer blow molding article The main mandrel which forms the passage for inner layer resin and has a through-hole for pressurization gas supply in a core is inserted in the inner circumference side of the container liner object established fixed movable in the vertical direction to the container liner object. The equipment for blow molding which formed the passage for outer layer resin and prepared the die body in the periphery side of the container liner object established fixed is known.

[0003]

[Problem(s) to be Solved by the Invention] As for a two-layer blow molding article, many various joints made of thermoplastic synthetic resin and containers of various configurations, such as a bottle, are seen. In the two-layer condition For example, the thing which allotted the coloring layer to the inner layer, allotted the transparence or transparence lusterless layer to the outer layer, and searched for the color effectiveness, What the class of synthetic resin used in a inner layer and an outer layer was made different, and searched for the effectiveness of rigidity, flexibility, or barrier property, the thing which changed thickness in the inner layer and the outer layer, and searched for the effectiveness of flexibility and curve nature are seen. [0004] If such two-layer-like blow molding articles are conventionally fabricated with the equipment for blow molding known, it is hard to control Sharp nature of the change part of thickness which cannot take the layer condition of a inner layer and an outer layer, and the thickness ratio in the large area which the thickness ratio of inner layer resin and outer layer resin cannot adjust to arbitration etc. in detail (management and adjustment), and the change-over to the mold goods of other forms may take time amount.

[0005]

[Means for Solving the Problem] The head for blow molding of the two-layer-like hollow cast of this invention While making the tubed sliding mandrel which can slide in the vertical direction intervene, forming the passage for inner layer resin, and the passage for outer layer resin, reducing the inflow of outer layer resin by sliding this tubed sliding mandrel downward and considering as a thin meat-like inner layer making the inflow of inner layer resin increase and considering as a heavy-gage-like inner layer -- moreover, while making the inflow of outer layer resin increase and considering as a heavy-gage-like outer layer by sliding this tubed sliding mandrel upward Since the inflow of inner layer resin can be reduced and it can consider as a thin meat-like inner layer, are highly precise in the inflow of outer layer resin and inner layer resin. It may be made to be able to change in a short time, and the thickness ratio of the inner layer of parison and an outer layer can be broadly adjusted to 1% - 99% or 99% - 1%, and arbitration, and although the mold goods which have a predetermined outer layer and a predetermined inner layer are fabricated easily, it can do.

[0006]

[Embodiment of the Invention] Hereafter, the configuration of this invention is concretely explained based on an example. Drawing 1 is one example of the head for blow molding of this invention, and the head for

blow molding consists of the tubed inner layer mandrel 1, the mandrel shaft 2, the tubed sliding mandrel 3, the passage 4 for inner layer resin, a tubed outer layer mandrel 5, passage 6 for outer layer resin, the die body 7, etc.

[0007] The extruder (not shown) which contained the screw is formed in each of inner layer resin input 4a which is open for free passage to the passage 4 for inner layer resin and the passage 6 for outer layer resin which were formed in the interior of this equipment for blow molding, and outer layer resin input 6a. Melting of the predetermined synthetic resin is carried out by this screw, and it flows to the passage 4 and 6 for resin on it.

[0008] It has formed in the condition of the inner layer mandrel 1 having been cylindrical, and it having been suitable at right angles to the body of equipment, and having been fixed, and the mandrel shaft 2 has fitted into the inner skin of this tubed inner layer mandrel 1 possible [ sliding of the vertical direction ] to the tubed inner layer mandrel 1. Through-hole 2a for supplying the pressurization gas sent from a compressor etc. (not shown) in Parison P is drilled in this core.

[0009] The passage 4 for inner layer resin is formed, and the tubed sliding mandrel 3 is allotted to the periphery side of the tubed inner layer mandrel 1. The tubed sliding mandrel 3 is formed in the condition which can slide in the vertical direction with a servo motor 8, the timing pulley 9, timing-belt 9a, a ball screw 10, the guide shaft 20, the shaft 11 that stands in a row in a guide bearing 21, and Guides 12a and 12b.

[0010] The tubed outer layer mandrel 5 is fitted into the peripheral face of this tubed sliding mandrel 3, further, the passage 6 for outer layer resin is formed, and the die body 7 is formed in the periphery side of the tubed outer layer mandrel 5. The tubed outer layer mandrel 5 is formed after having been fixed to it by the body of equipment, while having fitted into the peripheral face of the tubed sliding mandrel 3, without barring sliding of this tubed sliding mandrel 3.

[0011] The configuration of the passage 4 for inner layer resin formed of the tubed sliding mandrel 3, the tubed inner layer mandrel 1, the die body 7, and these and the passage 6 for outer layer resin is formed as shown in drawing 1 and drawing 2. That is, the tip of the tubed sliding mandrel 3 is carrying out the gestalt which inclined caudad toward the core of the mandrel shaft 2. In connection with this, the part corresponding to this part of the tubed inner layer mandrel 1 and the die body 7 is also the gestalt which inclined caudad similarly.

[0012] Since these gestalten are carried out, the opening of the passage 4 for inner layer resin and the passage 6 for outer layer resin can adjust suitably by sliding to the vertical direction of the tubed sliding mandrel 3. Whenever [ tilt-angle / of the point of the tubed sliding mandrel 3 ] in addition, inclination die length etc. For example according to the Sharp nature of the change [ by the configuration of mold goods, the class of use resin, a process condition, etc. ] by being heavy-gage with thin meat, the fitness process condition by the gap and use resin of resin passage, etc., the include angle of resin passage, If it puts in another way, whenever [ tilt-angle / of the point of a tubed sliding mandrel ] will be suitably chosen from the inclination die length which the range of is 40 - 80 degrees, and is deduced more rationally than them. Therefore, it is good to enable screw fitting exchange of the point of the tubed sliding mandrel 3.

[0013] Here, the passage 4 for inner layer resin opens the end for free passage to inner layer resin input 4a, and the other end is opened for free passage and formed in the other end of the outer layer resin passage 6. Moreover, the passage 6 for outer layer resin opens the end for free passage to outer layer resin input 6a, and the other end is opened for free passage and formed in the other end of the inner layer resin passage 4. Consequently, as shown in drawing 2, the inner layer resin passage 4 and the passage 6 for outer layer resin join by the point of the tubed sliding mandrel 3, and stand in a row in die opening for resin regurgitation formed of the resin unification way 15 and the die 13, and the core 14. The regurgitation and shaping of the fused resin are done as parison P of a predetermined configuration through these paths.

[0014] In addition, while holding the regurgitation and the fabricated parison P under a die 13 and the core 14, the molding die (not shown) which performs blow molding by supply of a pressurization gas is arranged.

[0015] While the outer layer 30 which shows actuation of the head for blow molding of this invention to drawing 3 consists of high-density-polyethylene resin (HDPE) and a inner layer 31 consists of for example, low-density-polyethylene resin (LDPE) The part 33 which, as for the stopper section 32, an outer layer 30

is formed in the shape of heavy-gage, and an inner layer 31 is formed in the shape of thin meat, and is imposed on a shoulder from the base of the stopper section 32. It explains by an outer layer 30 fabricating gradually the bottle 36 with which the inner layer 31 changed in the shape of heavy-gage in the shape of thin meat, as for the drum section 34 and the pars basilaris ossis occipitalis 35, the outer layer 30 was formed in the shape of thin meat, and the inner layer 31 was formed in the shape of heavy-gage.

[0016] Outer layers 30 decrease in number and the inflow of the resin for inner layers which flows in the inner layer resin passage 4 while the inflow of the resin for outer layers which flows in the outer layer resin passage 6 when an inner layer 31 slides upward shaping of the stopper section 32 of the bottle 36 which has become thin meat-like on the tubed sliding mandrel 3 by the shape of heavy-gage increases and becoming a heavy-gage-like outer layer serves as a thin meat-like inner layer.

[0017] Next, shaping of the part 33 where an outer layer 30 hangs a inner layer 31 on the shape of thin meat gradually at a shoulder from the base of the stopper section 32 which is becoming gradually at the shape of heavy-gage. While becoming the outer layer 30 which the inflow of the resin for outer layers which flows in the outer layer resin passage 6 by sliding the tubed sliding mandrel 3 downward gradually decreased, and inclined in the shape of thin meat toward the pars basilaris ossis occipitalis. The inflow of the resin for inner layers which flows in the inner layer resin passage 4 serves as the inner layer 31 which increased and inclined in the shape of heavy-gage toward the pars basilaris ossis occipitalis 35.

[0018] Then, while the inflow of the resin for outer layers which flows in the outer layer resin passage 6 when shaping of the drum section 34 and pars basilaris ossis occipitalis 35 in which the inner layer 31 was formed in the shape of heavy-gage in the shape of thin meat slides an outer layer 30 on the tubed sliding mandrel 3 downward decreases and becoming a thin meat-like outer layer, the inflow of the resin for inner layers which flows in the inner layer resin passage 4 increases, and serves as a heavy-gage-like inner layer.

[0019] this tubed sliding mandrel 3 -- the vertical direction, in order to change a heavy-gage-like outer layer and a thin meat-like inner layer and to form, if it slides and puts in another way. While operating the shaft 11 and guide 12 which stand in a row in a servo motor 8, the timing pulley 9, timing-belt 9a, and a ball screw 10 and sliding the tubed sliding mandrel 3 in the vertical direction. Actuation of rising and dropping the rotational frequency of the extruder (not shown) formed in inner layer resin input 4a which is open for free passage to the extruder (not shown) and the passage 4 for inner layer resin which have been established in outer layer resin input 6a which is open for free passage to the passage 6 for outer layer resin, Or it is carried out by aiming at increment and reduction of the inflow of the object for inner layers, and the resin for outer layers by actuation of making the opening of the shutoff valve (not shown) interposed between an extruder (not shown), outer layer resin input 6a, and inner layer resin input 4a opening and closing.

[0020] In addition, a series of actuation of the sliding actuation to the vertical direction, the engine speed of an extruder (not shown), modification of the opening of a shutoff valve (not shown), etc., etc. detects the resin pressure force for the tubed sliding mandrel 3 with the resin pressure gage 16 attached in outer layer resin input 6a, and it controls to always fix the resin pressure force using a microcomputer control means. or the thing for which the pattern of operation according to the property of use resin is made to program and memorize, and a change of a rotational frequency or opening is made -- automation -- the thing of a non-theory -- improvement in the quality of mold goods can be aimed at, and it is desirable.

[0021] Drawing 6 is an example of actuation to which the thickness of mold goods is changed, the rotational frequency of the extruder screw to which the rotational frequency of the extruder screw to which the relation between the rotational frequency of an extruder screw and the opening of a tubed sliding mandrel is shown, and an upper case flows the resin for inner layers, and the middle flow the resin for outer layers, and the lower berth are the opening of a tubed sliding mandrel, an axis of ordinate is variation and an axis of abscissa is time amount.

[0022] In the example of drawing 6, at the time of a start, the rotational frequency of the extruder screw (henceforth the screw for outer layers) which flows the resin for outer layers, and the extruder screw (henceforth the screw for inner layers) which flows the resin for inner layers is mostly made into the same number, then the rotational frequency of the screw for inner layers is reduced a little, and the rotational frequency of the screw for outer layers is quickly raised according to it so that more clearly than this. While raising a tubed sliding mandrel (minus display) and raising the opening of the passage for outer layer resin

in that case, the opening of the passage for inner layer resin is lowered, and thickness of the shape of heavy-gage and a inner layer is made into the shape of thin meat for the thickness of an outer layer.

[0023] Subsequently, the rotational frequency of the screw for inner layers is raised after predetermined time amount progress, and the rotational frequency of the screw for outer layers is reduced. While dropping a tubed sliding mandrel (plus display) and lowering the opening of the passage for outer layer resin then, the opening of the passage for inner layer resin is raised, and the thickness of the shape of thin meat and a inner layer considers [ the thickness of an outer layer ] as the shape of heavy-gage.

[0024] Furthermore, it continues, the rotational frequency of the screw for inner layers is reduced, and the rotational frequency of the screw for outer layers is raised according to it. While raising a tubed sliding mandrel (minus display) and raising the opening of the passage for outer layer resin in that case, the opening of the passage for inner layer resin is lowered, and thickness of the shape of heavy-gage and a inner layer is made into the shape of thin meat for the thickness of an outer layer.

[0025] Actuation of these single strings is controlled using hand control or a microcomputer control means, detecting the resin pressure force attached in the extruder, a resin flow rate, or the thickness of mold goods.

[0026] While using adjustment of the relative opening of the passage 4 for the inner layer resin in the resin unification way 15 of resin when it sliding-operates and puts in another way and the passage 6 for outer layer resin to the vertical direction for a servo motor etc., the tubed sliding mandrel 3 here that the broad ratio of a inner layer and an outer layer will be taken with 99% - 1% or 1% - 99 etc.% if inflow of the resin for inside-and-outside layers is adjusted by adjustment of the rotational frequency of an extruder, a inner layer, and an outer layer -- very -- Sharp (change of thickness is short -- distance can be carried out) -- also changing -- things become possible.

[0027] Since it hangs on a pars basilaris ossis occipitalis 35 from the stopper section 32 as shown in drawing 4 and the rib-like projection 37 can be formed if a semicircle-like fluting is formed in the outer layer resin passage 6 side point of the tubed sliding mandrel 3 as are shown in drawing 2, and a dotted line shows, the rigidity of this part can be raised. Moreover, while forming this fluting in saucerlike, bottle 36b from which only the predetermined part 38 as shown in drawing 5 became two-layer can be formed by sliding the tubed sliding mandrel 3 caudad, making it move to the outer layer resin passage 6 side, and making the outer layer resin passage 6 of parts other than this saucerlike fluting blockade. Moreover, this semicircle-like fluting and saucerlike fluting may be performed by the ring die 19 which countered tubed sliding mandrel 3 point.

[0028] In addition, the dimension and configuration of mold goods are also changeable by changing the core 14 at the tip of the mandrel shaft 2 with that from which a dimension and a configuration differ. Moreover, the whole mold-goods thickness, for example, the thickness of parison, is also preferably changeable in 1mm - 3mm 0.5mm - 5mm by sliding the mandrel shaft 2 in the vertical direction by actuation of a ball screw 17, a servo motor 18, etc. which have been formed in the another side edge of the mandrel shaft 2.

[0029] As mentioned above, although shaping of the bottle which the class of synthetic resin which uses the head for blow molding of this invention in a inner layer and an outer layer was made different, and searched for the effectiveness of rigidity, flexibility, or barrier property explained, shaping of the mold goods which changed thickness in the mold-goods thing and the inner layer which allotted the coloring layer to the inner layer, allotted the transparence or transparence lusterless layer to the outer layer, and searched for the color effectiveness, and the outer layer, and searched for the effectiveness of flexibility and curve nature is also possible. Furthermore, mold goods, such as various joints and containers of various configurations other than a bottle, can be fabricated by changing the configuration of the molding die which performs blow molding.

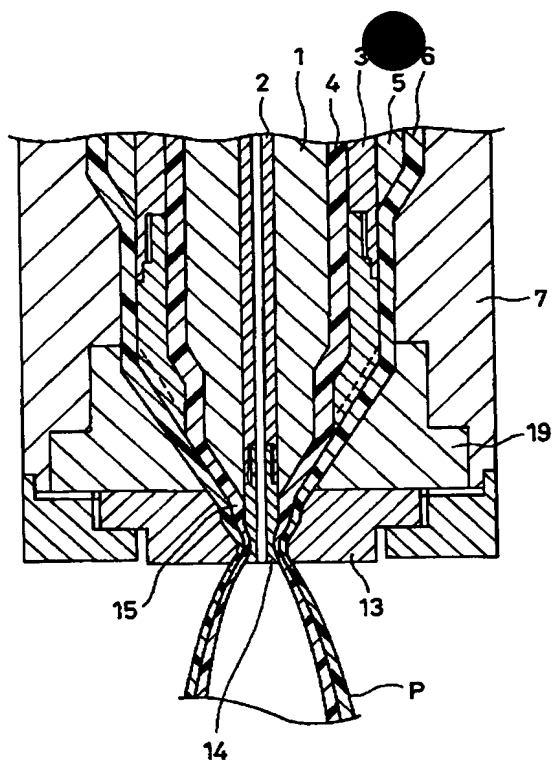
[0030]

[Effect of the Invention] if it fabricates with the head for blow molding of this invention -- the layer condition of a inner layer and an outer layer -- in detail, the thickness ratio of inner layer resin and outer layer resin can adjust to a large area and arbitration, and control (management and adjustment) becomes easy about the Sharp nature of the change part of thickness etc. Moreover, the change-over to the mold goods of other forms can be managed in a short time.

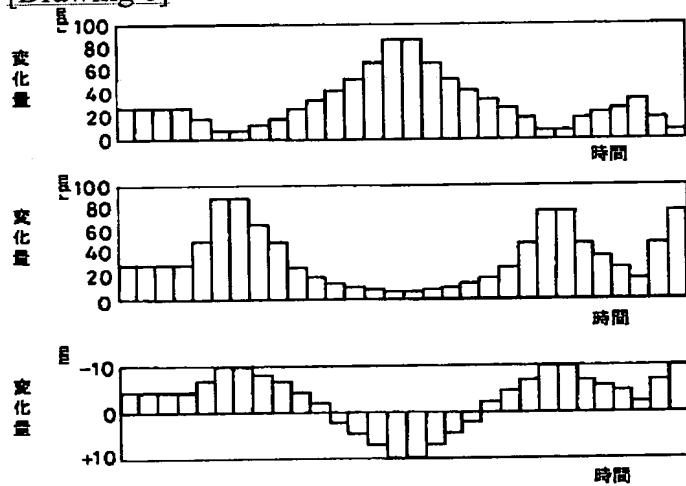
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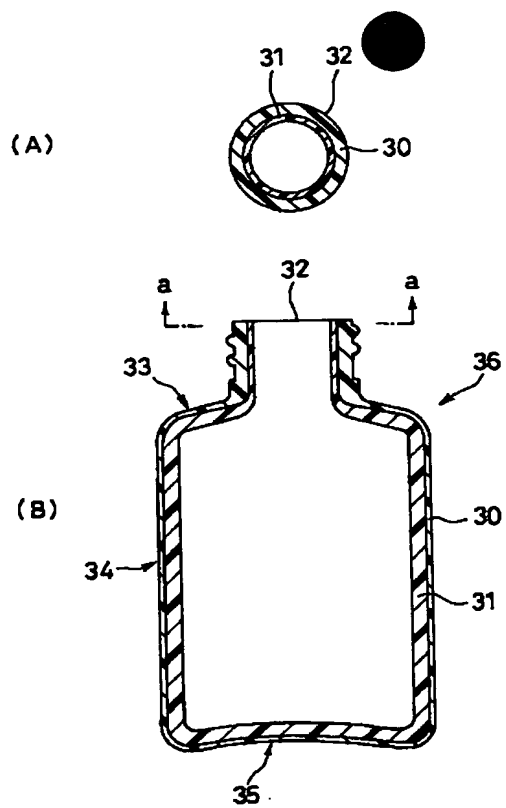




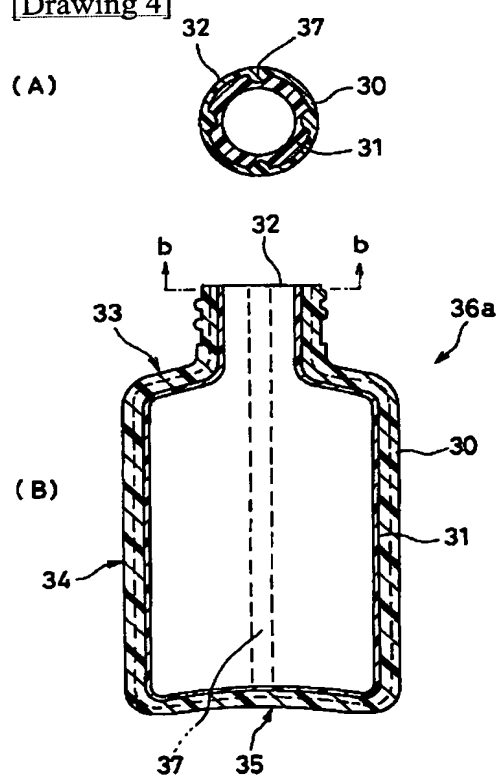
[Drawing 6]



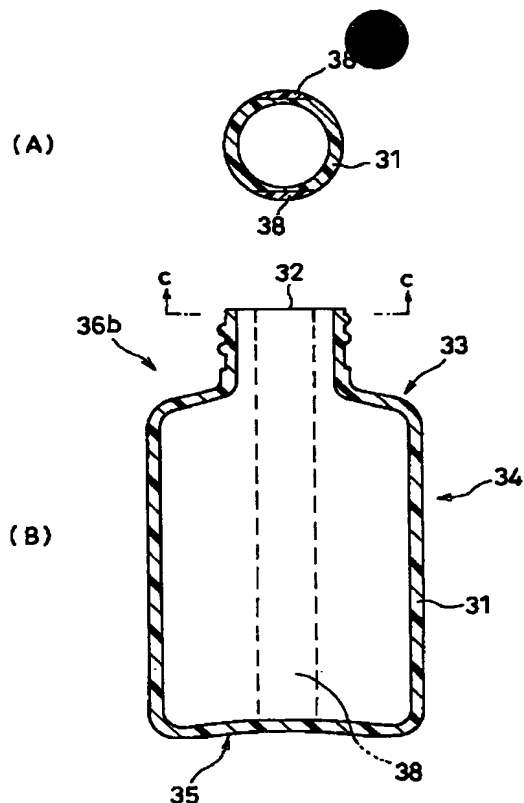
[Drawing 3]



[Drawing 4]



[Drawing 5]



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